

DOCUMENT RESUME

ED 356 292

UD 029 109

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TITLE Chinese Bilingual Math and Science. Community School District 2, Manhattan Transitional Bilingual Education, 1991-92. Final Evaluation Profile. OREA Report.
INSTITUTION New York City Board of Education, Brooklyn, NY. Office of Research, Evaluation, and Assessment.
PUB DATE Feb 93
CONTRACT T003A10197
NOTE 17p.
AVAILABLE FROM Office of Research, Evaluation, and Assessment, New York City Public Schools, 110 Livingston Street, Room 732, Brooklyn, NY 11201.
PUB TYPE Reports - Descriptive (141)
EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS *Bilingual Education Programs; *Chinese Americans; *Curriculum Evaluation; *Elementary School Students; *English (Second Language); Immigrants; Intermediate Grades; Language Proficiency; Limited English Speaking; *Mathematics Achievement; Reading Achievement; Science Education; Summer Programs; Thinking Skills; Urban Schools
IDENTIFIERS Asian American Students; Language Minorities; New York City Board of Education; *Science Achievement; Transitional Bilingual Education Programs

ABSTRACT

An evaluation was conducted of the first year of a 3-year program designed in New York City to serve the needs of Chinese-speaking intermediate grade students of limited English proficiency. The focus of the program was on improving their achievement in mathematics and science while also improving students' English language proficiency. The project proposed to provide enriched mathematics and science instruction in Chinese during the school year and in a 5-week summer institute, with workshops at the school district's Mathematics and Science Resource Center. The program admitted students who had scored at or below the 40th percentile on the Language Assessment Battery. The project enrolled 230 male and 185 female students in grades 4 through 6, of whom 97.8 percent were eligible for free lunches. For the most part, the program carried out the activities proposed in its design. The children were observed to enjoy the resource center activities in particular. The project met its objectives in English language proficiency and improvement of mathematics and higher order thinking skills. Objectives in English-as-a-Second-Language reading were not met. Objectives were met with regard to parent understanding of the children's mathematics and science education, but objectives for parent participation at activities scheduled for them were not met. Recommendations for program improvement in the remaining 2 years of federal funding are suggested. Appendixes describe data collection and analysis and instructional materials. (SLD)

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OREA Report

Chinese Bilingual Math and Science
Community School District 2, Manhattan
Transitional Bilingual Education Grant Number T003A1019
1991-92

FINAL EVALUATION PROFILE

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Chinese Bilingual Math and Science
Community School District 2, Manhattan
Transitional Bilingual Education Grant Number T003A10197
1991-92

FINAL EVALUATION PROFILE



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ACKNOWLEDGMENTS

This report has been prepared by the Bilingual, Multicultural, and Early Childhood Evaluation Unit of the Office of Research, Evaluation, and Assessment. Thanks are due to Joanne Lynch for collecting the data and writing the report.

Additional copies of this report are available from:

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FOREWORD

The body of this report is preceded by an Extract which presents an overview of salient points of the project: funding cycle; enrollment figures; background of students served; admission criteria; and programming features, strengths, and limitations, including the outcome of all objectives. The extract also presents the conclusions drawn by the Office of Research, Evaluation, and Assessment (OREA) about the program and its recommendations for program improvement.

The extract is followed by the body of the report, titled Program Assessment. This includes such information as staffing, program implementation, and outcome and implementation objectives. Instructional objectives are presented first, followed by noninstructional objectives. The report then addresses those aspects of programming mandated by Title VII regulations that do not have specifically stated objectives. This may be information on attendance and dropout rate, grade retention, mainstreaming, referrals out of the program to meet special needs of the students, and withdrawals. A case history concludes the report.

Data for this profile were collected and analyzed using a variety of procedures, which are described in Appendix A following the text.

Office of Research, Evaluation, and Assessment
New York City Public Schools
E.S.E.A. Title VII Evaluation Profile
Chinese Bilingual Math and Science
Community School District 2, Manhattan
Transitional Bilingual Education Grant T003A10197
1991-92

EXTRACT

PROJECT COORDINATOR: Ms. Kit Fung

FUNDING CYCLE: Year 1 of 3

SITES

<u>School</u>	<u>Grade Levels</u>	<u>Enrollment*</u>
P.S. 1	4-6	84
P.S. 2	4-6	114
P.S. 42	4-6	77
P.S. 124	4-6	56
P.S. 130	4-6	84

*The project enrolled 415 students. Male students numbered 230, female 185.

STUDENT BACKGROUND

<u>Native Language</u>	<u>Number of Students</u>	<u>Countries of Origin</u>	<u>Number of Students</u>
Chinese	399	China	341
Mandarin 87		Hong Kong	48
Cantonese 192		Malaya	6
Other 120		United States	5
Unreported 12		Taiwan	2
		Other	7
		Unreported	6

Median Years of Education in Native Country: 3.0; in the United States: 2.0

Percentage of Students Eligible for Free Lunch Program: 97.8

ADMISSION CRITERIA

The Chinese Bilingual Math and Science program admitted students who had scored at or below the 40th percentile on the Language Assessment Battery (LAB) and were thus classified as being of limited English proficiency (LEP).

PROGRAMMING

Design Features

The Chinese Bilingual Math and Science project was designed to serve the needs of Chinese-speaking LEP students. The focus of programming was on improving students' achievement in mathematics and science while also improving their English language proficiency. The project proposed to provide enriched mathematics and science instruction in Chinese during the school year and at a five week summer institute. Staff attended

workshops every month at the Community School District's (C.S.D.'s) Mathematics and Science Resource Center. After each workshop, project students returned with the teachers to the resource center and participated in hands-on and experiential activities that augmented classroom instruction.

Capacity building. After three years of federal funding, C.S.D. 2 will support the project with tax levy and other funds.

Strengths and Limitations

For the most part, the Chinese Bilingual Math and Science program carried out the activities proposed in its design. Project staff noted that the children particularly enjoyed the resource center. The materials provided through the project were exemplary.

CONCLUSIONS AND RECOMMENDATIONS

In its first year of programming, the project met its E.S.L. objectives for English language proficiency, improvement in mathematics skills, mastery of mathematics, high order thinking skills related to mathematics, science, student career awareness, staff development, and parental understanding of and participation in their child's mathematics and science education. The project did not meet its objectives for E.S.L. reading and attendance at parental activities. The Office of Research, Evaluation, and Assessment (OREA) could not evaluate the objective for the Citywide Science exam as currently stated.

The conclusions, based on the findings of this evaluation, lead to the following recommendations:

- Explore reasons why students' achievement of English language skills as measured by the Degrees of Reading Power (D.R.P.) test was less than anticipated and take steps to rectify the situation in the future.
- Attempt to increase attendance at parent activities.
- Seek permission to replace the objective for the Citywide Science exam.

PROGRAM ASSESSMENT

STAFFING

Title VII Staff (Total 2)

<u>Title</u>	<u>Degree</u>	<u>Language Competencies</u>	<u>Title VII Funding</u>
Resource Specialist	M.A.	Cantonese	Full time
Resource Specialist	M.A.	Cantonese	Full time

Other Staff Working With Project Students (Total 14)

<u>Title</u>	<u>Degrees</u>	<u>Certification</u>	<u>Language Competencies and Teaching/Communicative Proficiencies (TP/CP)*</u>
Teacher 14	M.A. 13 B.A. 1	Bil. Chinese Common Branches 6 Bil. Chinese Com. Branches PPT 1 Bil. Common Branches TPD 2 Bilingual PPT 1 E.S.L. Common Branches 1 Bilingual Chinese 1 Common Branches DES 2 Chinese Bilingual Ancillary 1 E.S.L. Ancillary 2 Mandarin 2 Cantonese 1	Chinese TP 13, CP 1

All staff had certification in areas they served.

IMPLEMENTATION AND OUTCOMES (Objectives prefaced by ●)

English as a Second Language (E.S.L.)

Students received five periods of E.S.L. per week. Techniques of instruction included such activities as creating books, sharing stories, and using hands-on manipulatives in a whole-language approach.

See Appendix B for a list of the instructional materials used.

- Participating LEP students will have shown improvement on the English language version of the LAB greater than that of a non-project comparison group.
- Participating students will improve their English language skills as demonstrated by a significant increase in scores on the Language Assessment Battery (LAB), as measured by a correlated *t*-test for significance of difference between pre- and posttest scores converted into Normal Curve Equivalent (N.C.E.) units.

*Teaching Proficiency (TP): Competent to teach in this language.
Communicative Proficiency (CP): Conversational capability only.

Evaluation Instrument: Language Assessment Battery (LAB)*

Pretest: May 1991; posttest: May 1992.

Number of students for whom pre- and posttest data were reported: 289

Percent of students with pretest/posttest gains: 64.4

Mean gain: 7.5 N.C.E.s (s.d.=9.2)

Mean gain is statistically significant ($t=13.85$, $p<.05$).

Project met both E.S.L. objectives for English language proficiency.

- Participating students will improve their English language skills as demonstrated by a significant increase in scores on the Degrees of Reading Power (D.R.P.) test, as measured by a correlated t -test for significance of difference between pre- and posttest scores converted into Normal Curve Equivalent (N.C.E.) units.

Evaluation Instrument: Degrees of Reading Power (D.R.P.)

Pretest: May 1991; posttest: May 1992.

Number of students for whom pre- and posttest data were reported: 44

Mean gain: 1.14 N.C.E.s (s.d.=9.4)

Mean gain is not statistically significant ($t=.80$, $p>.05$).

Project did not meet E.S.L. reading objective. The project director indicated that additional staff development regarding effective ways of teaching E.S.L. will be given in the 1992-93 school year.

Native Language Arts (N.L.A.)

Students lacking native language literacy skills (estimated): 15 percent.

Students received five periods of N.L.A. instruction per week. The teaching method used was total physical response, which incorporated the translation of key vocabulary, concepts, and lessons in Chinese and in English.

See Appendix B for a list of the instructional materials used.

*OREA used a gap reduction design to evaluate the effect of supplementary instruction on project students' performance on the LAB. Since all LEP students in New York City are entitled to such instruction, no valid comparison group exists among these students, and OREA used instead the group on which the LAB was normed. Test scores are reported in Normal Curve Equivalents (N.C.E.s), which are normalized standard scores with a mean of 50 and a standard deviation of 21.06. It is assumed that the norm group has a zero gain in N.C.E.s in the absence of supplementary instruction and that participating students' gains are attributable to project services.

Content Area Subjects

Mathematics. Students received five periods of mathematics instruction each week. Teachers emphasized hands-on and manipulative techniques and games. For those project students on the lowest level of English proficiency, instruction was in Chinese. As they became more proficient, instruction progressed to English supplemented by Chinese, and finally to English with an E.S.L. approach.

- Participating students will improve their mathematics skills as demonstrated by a significant increase in scores on the Metropolitan Achievement Test (MAT) in mathematics, as measured by a correlated *t*-test for significance of difference between pre- and posttest scores converted into Normal Curve Equivalent (N.C.E.) units.

Evaluation Instrument: Metropolitan Achievement Test in Mathematics (MAT-Math)

Pretest: April 1991; posttest: April 1992.

Number of students for whom pre- and posttest data were reported: 125

Mean gain: 9.46 N.C.E.s (s.d.=13.5)

Mean gain is statistically significant ($t=7.84, p<.05$).

Project met objective for improvement in mathematics skills.

- At least 75 percent of participating students will demonstrate a mastery of mathematics by scoring 80 percent or higher on a criterion-referenced district or teacher-developed Chinese language mathematics test.

Evaluation Indicator: final course grades. (Final course grades had to be used since a Chinese language mathematics test was not available.)

Percent of students receiving final grades of at least 80: 88

Project met objective for mastery of mathematics.

- At least 75 percent of students will demonstrate acquisition of high-order thinking skills related to mathematics.

Evaluation Instrument: Problem Solving subtest of the MAT-Math.

Number of students for whom pre- and posttest data were reported: 125

Mean gain: 8.66 N.C.E.s (s.d.=16.46)

Mean gain is statistically significant ($t=5.88, p<.05$).

Project met objective for high order thinking skills related to mathematics.

Science. Students received three periods of science instruction weekly. As English proficiency increased, project students received less instruction in Chinese and more in English until classes were entirely in English using an E.S.L. methodology. Instruction included the use of hands-on activities. Students created natural habitats such as a butterfly nest and an ant farm, and used prisms, magnets, batteries, etcetera.

See Appendix B for a list of the instructional materials used.

- Participating students will improve their science skills, as demonstrated by a significant increase in scores on the Citywide Standardized Science Achievement Test.

This objective could not be measured as stated since only fourth graders take the exam, and it is only given once, precluding any measurement of improvement.

Objective for Citywide Science Achievement Test could not be measured. OREA recommends that this objective be revised for the 1992-93 school year.

- Seventy-five percent of students will score 80 percent or better on a criterion-referenced district or teacher-developed Chinese language science test.

Evaluation Indicator: final course grades. (Final course grades were used since a Chinese language science test was not available).

Percent of students receiving a grade of at least 80: 89

Project met objective for science.

Career Awareness

Students involved in the project received information designed to make them more aware of career opportunities in the fields of mathematics and science. A Career Awareness Day was held at P.S. 1 and students from all schools were invited.

- Seventy-five percent of students will demonstrate acquisition of information about mathematics and science-related education, training, and employment options.

Evaluation Indicator: OREA-developed questionnaire to measure knowledge of educational requirements and employment opportunities in mathematics- and science-related fields.

OREA developed a questionnaire which required students to list jobs related to mathematics and science and what type of education was needed for these jobs. Ninety-five percent of students demonstrated knowledge of educational requirements and career opportunities in mathematics and science.

Project met objective for career awareness.

Attendance

No attendance objective was proposed. However, attendance rates are listed below.

<u>School</u>	<u>Project Students Attendance Rate</u>	<u>Mainstream Students</u>
P.S. 1	96.7	92.6
P.S. 2	99.0	94.4
P.S. 42	98.1	95.7
P.S. 124	98.0	96.2
P.S. 130	98.8	94.9

At each school, project students' attendance was higher than that of the mainstream students.

Other Activities

Project students participated in various trips over the year, including a camping trip to Gateway National Park, and visits to the New York Hall of Science and the Brooklyn Academy of Music.

Students With Special Academic Needs

Referral to special education. Teachers referred students whose ability to function in the program was in doubt to a School-based Support Team (S.B.S.T.). The educational evaluator and the counselor were bilingual. No students were referred to special education.

Remedial programs. No students were referred to remedial programs.

Gifted and talented programs. The project offered special computer programs to children who were gifted or talented. No students were referred to programs for the gifted and talented.

Staff Development

The project held staff development workshops for project teachers every month at the district Science Resource Center. Topics included: "Science in the Elementary School," "Water in Our Lives," "Electricity -- Methods and Motivation," "Insect-Life Cycle," "Go Take a Hike," and "Your Place in Nature." The resource specialists supervised the teachers when they later presented this material to their classes.

An OREA-developed questionnaire examined whether participating teachers increased their knowledge of and their ability to teach bilingual mathematics and science. The questionnaire also asked teachers to rate their satisfaction with the project curriculum.

- At least 80 percent of participating teachers and paraprofessionals will have demonstrated an increased knowledge of bilingual mathematics and science content and methodology, as measured by pre- and post-training questionnaires.

All the participating teachers indicated that their knowledge of bilingual mathematics and science content and methodology increased as a result of the workshops.

Project met objective for increasing staff knowledge.

- At least 80 percent of participating teachers and paraprofessionals will have improved their ability to use project content and methodology, as measured by pre- and post questionnaires and by structured classroom observations by the program director, staff developers, and an independent evaluator.

All the participating teachers indicated that their ability to use project content and methodology improved as a result of the workshops.

Project met objective for improvement in staff ability.

- At least 80 percent of the participating teachers will find satisfactory for use with their students project adapted curriculum, as measured by a questionnaire.

All the participating teachers indicated that they found the project curriculum satisfactory.

Project met objective for staff satisfaction with curriculum.

Summer Institute

A summer institute was held for staff for one week in August. Staff were given training in hands-on activities to use in teaching mathematics and science.

- By August 31, 1992, at least 80 percent of teachers and paraprofessionals participating in the summer training institute will have demonstrated an increased knowledge of bilingual mathematics and science content and methodology, as measured by pre- and post-training questionnaires.

An OREA-developed questionnaire examined whether staff participating in the summer training institute increased their knowledge of bilingual mathematics and science content as well as methodology. All the participating staff indicated that their knowledge of bilingual mathematics and science content and methodology increased as a result of the training they received at the summer institute.

Project met objective for summer institute.

Parental Involvement

- At least 60 percent of parents of participating students will have taken part in three or more activities for parents, as measured by attendance records for parental involvement activities.

Parents of project students attended various activities throughout the school year. The project director provided the following attendance rates for activities: Advisory council meetings 30 percent, open-school day/evening 40 percent, parent-teacher conferences 90 percent, and Citywide Chinese Parents Conference 80 percent.

Project did not meet objective for parental involvement. The project director indicated that for the 1992-93 school year, advisory council meetings will be held in the schools involved in the project instead of the district office so that more parents will be able to attend. In addition, staff developers will accompany parents if they have to travel to another site to attend activities.

- At least 60 percent of the parents of participating students will have demonstrated a satisfactory level of understanding of and participation in their children's mathematics and science education, as measured by a parent checklist in English and Chinese and by teacher reports.

Parents received an OREA-developed English and Chinese language questionnaire to assess their understanding of and participation in their children's mathematics and science education. All the respondents indicated that participating in the program helped them to understand their child's mathematics education. Ninety-nine percent indicated that participating in the program helped them to understand their child's science education. Ninety-nine percent indicated that, as a result of the program, they have participated more in their child's mathematics education. Ninety-six percent indicated that as a result of participating in the program they have participated more in their child's science education.

Project met objective for parental understanding of and participation in their child's mathematics and science education.

CASE HISTORY

The project did not provide a case history.

APPENDIX A

DATA COLLECTION AND ANALYSIS

COLLECTION

OREA evaluation consultants visit sites and interview key personnel. The project director gathers data and, with the consultant, completes forms (as shown below) as necessary.

Student Data Form

This one-page form is filled out by staff for each participating and mainstreamed student. OREA gathers data from this form on backgrounds, demographics, academic outcomes, attendance, referrals, and exit from the program.

Project Director's Questionnaire

The Project Director's Questionnaire includes questions on staff qualifications, program implementation, periods of instruction, and instructional materials and techniques.

Project Director's Interview

The interview gathers information on program and student or staff characteristics not supplied by the Project Director's Questionnaire. The interview also allows project staff to offer qualitative data or amplify responses to the questionnaire.

Citywide Test Scores

OREA retrieves scores centrally from the Language Assessment Battery (LAB) and other citywide tests. For evaluation purposes, these test scores are reported in Normal Curve Equivalents (N.C.E.s). N.C.E.s are normalized standard scores with a mean of 50 and a standard deviation (s.d.) of 21.06. They constitute an equal-interval scale in which the distance is the same between any two adjacent scores. A gain of 5 N.C.E.s is the same whether it is at the lower or the higher end of the scale. N.C.E.s can be used in arithmetic computations to indicate group progress. (Percentile scales, although more familiar to many, are unsuitable for such computations since they are not equal-interval.)

Likert-Type Surveys

Likert-type surveys, in which respondents mark their opinions on a scale from one to five, are used in a variety of ways. They examine student attitudes (i.e., toward school and career, native language use, and native and mainstream cultures). They also assess staff and parent attitude and reactions to workshops and other activities.

ANALYSIS

Gap Reduction Evaluation Design

OREA uses a gap reduction design for measuring changes in standardized tests. Since no appropriate non-project comparison group is available in New York City, where all students of limited English proficiency (LEP) are entitled to receive supplementary services, OREA compares the progress of participating students with that of the group on which the test was normed. It is assumed that the norm group would show a zero gain in the absence of instruction, and gains made by project students could be attributed to project services. Scores are reported in Normal Curve Equivalents (N.C.E.s), which are normalized standard scores with a mean of 50 and a standard deviation of 21.06. (See "Citywide Test Scores" above.)

To test whether pre/posttest gains are greater than could be expected by chance alone, OREA uses a *t*-test. To test whether a difference between two proportions (e.g., program and mainstream attendance rates) is

greater than could be expected by chance, OREA uses a z-test and reports the differences between the two proportions. The level of significance is set at .05 for all tests.

Techniques For Minimizing Error

The evaluation procedures minimize error by providing for proper administration of evaluation instruments through a combination of testing at 12-month intervals, appropriate analysis procedures and reporting.

Instruments of measurement include the LAB (see above), the Degrees of Reading Power (D.R.P.) test, the Metropolitan Achievement Test--Mathematics (MAT-Math), El Examen de Lectura en Español (ELE), Likert-type scales (see above), and project-developed tests. Except for Likert scales and project-developed tests, these instruments are scored on a citywide basis at the Scan Center of the New York City Public Schools.

APPENDIX B

INSTRUCTIONAL MATERIALS

E.S.L.

The Four Elements
The Four Senses
The Four Seasons
Life on Earth
Aims Publications
Science in the Content Area
Sunshine Science Series

Greenshower, 1990
 Greenshower, 1990
 Greenshower, 1990
 Greenshower, 1990
 Aims Education Foundation, 1987
 Rigby, 1990
 Wright Group, 1990

N.L.A.

The Four Elements
The Four Senses
The Four Seasons
Life on Earth

Greenshower, 1990
 Greenshower, 1990
 Greenshower, 1990
 Greenshower, 1990

Mathematics

AIMS-Adventures in Math and Science
Game 24
Chinese Mathematics

R. Sun

Aims Education Foundation, 1987
 Suntex International, 1989
 Evaluation Dissemination and
 Assessment Center

Progress in Math
Mathematics

D. Gundlach, K. Buffie
 Duncan, Quast, Capps, Ebos

Laidlaw Brothers
 Houghton Mifflin Company